COMPLETE LISTING OF CLAIMS

Listing of Claims:

Claims 1-38 (canceled)

39. (currently amended) An electronic cooling device ~~for cooling a heat source,~~ comprising:

a heat source;

a cathode comprising at least one microtip emitter structure on a base electrode, the microtip emitter structure comprising polycrystalline diamond, the emitter structure being characterized by having a semiconductor conduction band;

an anode positioned over and spaced apart from the cathode by a vacuum space,

the microtip emitter structure further comprising enhancement means for causing a curvature~~bending~~ of the conduction band;

a power supply electrically connected to the cathode and anode, the power supply applying an electrical bias of sufficient potential to cause, in cooperation with the curvature of the conduction band~~enhancement means~~, preferential emission of higher energy electrons from the cathode through the vacuum and deposition in the anode; and

the cathode is thermally connected to the heat source so that the preferential emission of high energy electrons from the cathode causes a corresponding transfer of thermal energy from the heat source to the anode.

40. (previously presented) The electronic cooling device of claim 39, wherein the enhancement means comprises a geometric tip enhancement.

41. (currently amended) An electronic cooling device, comprising:

a cathode comprising at least one emitter structure on a base electrode, the emitter structure including a diamond microtip extending upwardly from and formed integral to a diamond substrate having a top surface;

an anode layer spaced apart from the emitter and suspended above the diamond substrate by a first insulating layer extending upwardly from the top surface of the diamond substrate;

a porous gate positioned above and spaced apart from the diamond microtip, supported by a second insulating layer extending upwardly from a top surface of the anode layer;

a biasing energy supply adapted to bias the anode and the gate, the bias of sufficient potential to cause electron emission from the base electrode through the cathode into the conduction band, then through the vacuum and deposition in the anode; and

the cathode further comprising a conduction band and means to cause a curvature of the conduction band to enhance preferential emission of higher energy electrons thereby to enhance transfer of thermal energy from the cathode to the anode.

42. (previously presented) The device of claim 41, wherein the porous gate is constructed in a grid arrangement.

43. (previously presented) The device of claim 41 wherein the porous gate comprises an annular gate structure.

44 (canceled)

45. (currently amended) A method for thermal – electrical energy conversion using an electronic device having a diamond microtip cathode separated from an anode by a vacuum space, the cathode being characterized by having a cathode conduction band, the method comprising:

curving ~~bending~~ the cathode conduction band to increase preferential field emission of higher energy electrons thereby causing~~and cause~~ a corresponding enhanced transfer of thermal energy from the cathode to the anode.

46. (canceled)

47. (currently amended) The method for thermal – electrical energy conversion of claim 45 wherein the electronic device includes a base electrode connected to the cathode at an interface and wherein the band bending occurs near the base-electrode/cathode interface

48. (canceled)

49. (currently amended) The method for thermal – electrical energy conversion of claim 45 wherein the step of curving ~~bending~~ the conduction band to cause preferential transfer of high energy electrons comprises adding sp2-bonded molecular structures within the diamond structure .

50. (canceled)

51. (currently amended) The method for thermal – electrical energy conversion of claim 45, further comprising:

decreasing the resistance to electron flow between the cathode and anode through the use of a gate electrode that is electrically biased to extract electrons from the cathode while allowing emitted electrons to bypass the gate.

Claims 52-55 (canceled)

56. (currently amended) A thermal to electrical energy conversion device comprising:

a thermal energy source;

a cathode comprising a diamond microtip emitter mounted on a base electrode, the cathode thermally connected to the thermal energy source;;

an anode spaced from the cathode;

an electrical load electrically connected to the anode and cathode; and

the cathode having a conduction band and further comprising emission enhancement means to curve the conduction band and cause preferential emission of higher energy electrons from the cathode in response to transfer of thermal energy from the thermal energy source to the cathode, thereby to cause the anode and cathode to transfer electrical energy to the load.

57. (canceled)

58. (canceled)

59. (previously presented) The device of Claim 56 wherein the emission enhancement means comprises a geometric of the diamond microtip emitter.

60. (previously presented) The device of Claim 56 wherein the emission enhancement means comprises sp2-bonded molecular structures within the diamond microtip.

61. (canceled)